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The Nature of Inflammation.

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THE NATURE OF INFLAMMATION.

There is no abnormal condition of the human system or of its various parts, which calls for the physician's or surgeon's aid so frequently as a condition universally designated *inflammation*. Every organ, every tissue, from centre to circumference, inclusive, inside or outside, this process is liable to invade with grades of danger, ranging from slightly noticed inconvenience and discomfort, to immediately threatening death. How to meet and successfully avert the ultimate or unrestrained, disastrous, or fatal consequences of this inflammatory process has been for ages past, and will be for ages to come, the greatest desideratum of medical art. What is inflammation? I can quote you many specimens of attempted definition, from both ancient and modern authors, but none of us are satisfied with any definition yet formulated. The problem is a difficult one, while increased observation and experiment as yet only push the conclusion we seek into deeper obscurity. Until recent times, it was thought the question was sufficiently answered, by a description of the more manifest symptoms, and a notation of some of the more apparent causes or agencies in producing or inducing inflammatory action. Again, it has been queried, whether inflammation is a disease of the nervous or sanguineous system, and if of the blood, whether it is a general diseased condition, affecting at the same time every atom of the whole body, or only a local condition, say of the eye, and not as to the toes; the fingers, lungs, the brain and not the stomach. Or again, if it is a disease of the nervous system, must it of necessity involve the sum total of the nervous system, or only a part, and a part also not be affected? We need not at this time pretend to enumerate all the theories that have been, or are now entertained. But this much I assert with emphasis, that the practice of any teacher or writer, will guide him largely to formulate a theory, to prove his practice correct. How true this is in regard of the phlogistic theory, and the anti-phlogistic treatment, you can scarcely have failed to



observe. Others, observing the deranged and diminished action of the secretory system, direct their whole line of treatment to increase the secretions, and obtaining some satisfactory result from that treatment, are ready to assert and maintain that the origin and essence of the disease is chargeable to diminished action of the secretory system, and thus show us quite a plausible philosophy. The same, or similar conclusions, are reached by those who direct their attention to the altered conditions of the emunctory system. I presume we should be prepared to witness the same conditions when a microbian origin for inflammation shall be asserted or assumed. And if it so shall be, and another bubble burst, to come and to go, it will be neither the first and probably not the last sad and disappointing experience.

Very early in the history of medical art, four of the more commonly observed symptoms of inflammation, were well known and described by Celsus, to wit: Redness; heat, pain and swelling. Not alone did that old veteran in medical art, assume that in his short statement, he gave a full and sufficient definition of the inflammatory process. It was standard for 1,500 years, and remained quite universally satisfactory, for 250 years after the great discovery of Harvey, as perfected by Boerhaave and his co-laborers. From that period it became easy enough to formulate the phlogistic theory by embodying the four symptoms described so long before by Celsus. Before the discovery by Harvey, of the double office of the heart, the oxygenation of the blood, and casting off the products or refuse of the internal human combustion, it does not seem possible that any reasonable theory for the inflammatory process could have been formulated—that is, reasonable to us, from our knowledge of anatomical and physiological facts. Inflammation for those hundreds of years must, however, have been just what it is to-day, and from the first advent of human beings on the earth. From the ripened fruit of Harvey's discovery soon was hatched and formulated the phlogistic theory, and the anti-phlogistic treatment of inflammation. Understand me, I am not now speaking of inflammation from traumatism, nor from specific causes, as small-pox, erysipelas,

measles, etc., but what has generally been represented or called idiopathic inflammation. Latterly, the term "infective" is proposed in the place and stead of idiopathic. I do not like the change, for the word infective will not express the general fact as well as idiopathic. It is too limited in its application, just as idiopathic is the contrary. I shall have occasion again to speak of this further on. I will now put the case this way. To-day an individual is in perfect health as far as known. You are called in to-morrow and find him with a pneumonia, phrenitis, nephritis, carditis, bronchitis, gastritis or other *itis*, as you please. We may waive dispute as to idiopathic and infective names, as also for the present, the causes, either probable, possible or real, for that is not the conundrum proposed. What is inflammation? What is its nature? In what, of what, does it essentially consist? Can we discover the nest egg or original factor among all the organs and parts, fluids and solids, or from or among all the various functions? Can we name the place from whence the symptoms arise and proceed? In law, frequently, the grand question is, who struck the first blow, that in the melee terminated in the killing of a man? Not unlike it, is the problem now proposed—what organ, what system, what function first balked or kicked, and thus deranged the whole machine and engendered the state we name inflammation? And again, was the cause from within or without? At a single glance you see it is a case of inflammation. The throbbing heart, the increased rapidity of the sanguineous flow, the rapid respiration, pain, etc., help to make your diagnosis—most certainly the present symptoms were not present at the beginning. By inquiry you learn what you would be pretty safe in assuming to know; that the present symptoms were preceded by a chill or rigor, a sense of coldness; not heat; a feeble pulse, a sense of general contraction, not expansion. The first noticeable symptom, or changed action of the sanguineous system is of diminished and decreased action. The heart beat is feeble, the arteries reduced in size, the pulse beat known as small and wiry. The starting point, so far as we can observe, appears to be a shock to the nervous system, as manifest by the chill. The

reaction from that is the unnatural and increased performance of the sanguineous system, acting, as acting it must in response to the command of nervous influence and excitement. The question forced upon us is this: Does the train of symptoms first inaugurated follow each other in the relation of cause and effect?

It is scarcely to be doubted that the primary or first symptom of the train to follow, is observed as some offence to the nervous system. This is certainly the case as regards inflammation from direct injury or traumatism, nor is it much less certain, as to what we call idiopathic inflammation. Nervous shock and pain from direct injury are too manifest, too often observed and experienced, to require more than mere mention. For sixty years the poor frog, rabbit and dog have been the subjects of endless experiment, for the purpose of throwing some light upon the process and nature of inflammation. To what insignificant beneficial results, medical men as well as laymen can abundantly testify. A frog is not a man, nor is man a rabbit. Should we attempt to mutilate a man as we do the frog, the man would probably manifest some qualities and symptoms which the frog does not.

The volumes written to describe, and the diagrams to illustrate, what takes place in the second and later stages of the inflammatory process, never have, never will, and never can give us the knowledge we so much desire, as to the essential nature and the operations of the first factor in idiopathic inflammation. The greater of these herculean labors and wonderful experiments have been to show us the manner in which the blood substance departs from the congested capillaries. Blood substance, in health, is always passing out of the capillaries for the nourishment and growth of all the tissues and organs. In inflammation, the only difference is that there is a superfluous amount thrown out, which unappropriated by the process of natural requirement, becomes foreign matter, and an offence to the regular and natural performance of healthy function. A blister applied to the cutaneous surface will cause the same material to pass through and out from the capillaries. The fact is everything, the modus is of inferior

consequence. Discoveries subsequent to congestion and effusion are entirely too late to give us correct ideas of the nature of inflammation, or to indicate a theory from whence we may found a preventive or curative practice. If the natural, anatomical, physiological, and psychological conditions of a man and the frog were more nearly alike the experiments would be of much more value.

But what do we observe in idiopathic inflammation? Lassitude, a sense of uneasiness and discomfort more or less manifest, but the chill or rigor is the emphatic indication of the impending inflammation. In fact, it alone is pathognomonic, positive, and unmistakably certain. In the more violent shocks to the nervous system, from whatever cause, the chill or rigor, may be so severe and desperate as to paralyze the sanguineous system to that extent, that reaction does not follow, and death ensues. In such case it is termed death from shock, whether the cause is injury or traumatism, or idiopathic, as from exposure to cold. The ability of the sanguineous system in health, to perform its work efficiently, or in disease, to perform curative work, depends upon its supply of nervous energy. If, therefore, by a severance of the nervous system or its paralysis from toxic cause or chill, the tonicity of the heart and arteries ceases, death is inevitable. Just as certain as that day follows night, is chill followed by an increased activity in the blood circulation, by a sense of increased heat, a more rapid respiration, congestion of the capillaries, exudation of blood substance, with a tendency of the morbid action to some particular vital part or organ. Upon what rule nature makes her selection of organ or region for exudation and possible necrosis, we do not know. Redness, pain, swelling and impaired function give us to understand the part she is selecting or dooming for necrosis. Possibly the effects of the first shock to the nervous system, upon the secretory or emunctory systems, have been too lightly estimated, for it is certain that from the period of chill the secretions are arrested, as also the emunctory function. These, of themselves, must rapidly produce dangerous if not fatal results if protracted.

Our remarks upon the necessity of constant nervous tonic

supply of energy to the whole sanguineous system, applies with equal force to the secretory and emunctory systems or functions. Both the latter must be taken into account in our estimate of the nature of the inflammatory process. The orderly and healthy performance of natural functions in man, is partly governed by the laws of physics and chemistry, but not entirely so. Beyond the power of natural vision or our greatest multiple of the same by microscopic aid, beyond our widest range of observation, experiment, or delicacy of test, we are impressed that there is still an unseen power, in constant and efficient operation, which the human mind has hitherto been unable to exactly appreciate, examine, explain or understand, and unable to formulate to a rule. It has been called vital power, vital principle, etc. It is this unknown quantity that knocks us on the head when we cannot understand how we lost our patient. Our nearest approach to an understanding of these unseen forces or powers, is like the search for infinity. There will still remain, like the gauzy curtain dividing life from death, a separation of scarcely tangible texture, penetrable to spirit only, impervious to physical sense, and yet we feel impressed by the magic power, conscious that *our* secret thoughts are known and judged by the mystic power so awfully near, just behind the screen. Impassible and charming barrier, precious contiguity! Here the best men of our profession and race have presented themselves by day and by night, sleeping or waking, waiting, waiting, watching, praying for one glimpse beyond the curtain, the abode of verity, the home of ultimate truth. Failing in this direction to discover the origin of first causes we fall back upon our own finite and limited resources and forge the phrase "vital," only another word for the unknown and possibly the unknowable.

The grosser forms of injury to the nervous system that are most common in lighting up the fires of inflammation, we can easily appreciate and understand. But there are other causes or injuries less manifest to our senses and observation, and yet are most potent and powerful to produce the gravest and most formidable forms of inflammation; so very idiopathic indeed that they range above, beyond, outside and independent of the

ordinary range of so called idiopathic causes. And right here is where the frog theories cease to have for us any value. A physician need not to practice very many years to become convinced that undue emotions, peculiar to human beings, giving but feeble outward signs, may rack the frame from center to circumference, dethrone reason, defy all rules, disturb the very soul's repose, and produce the train of symptoms of inflammation, directing the course to the most vital parts, leaving the body partially intact, first robbing it of all that makes life valuable, or existence tolerable. The nature of inflammation cannot be compassed and formulated definitely, except by investigation of its various causes, its phenomena or progressive course of development, its tendency unobstructed by art, and by modification produced by treatment. The sole object of our investigation into its nature is designed for its aim and end to direct us to the best course of treatment for its abatement and cure. The formulating of our theory is our first step in that direction. The proving of our theory is by obtaining satisfactory and successful results from the practice indicated by our theory. If another theory and another practice produces better results we are bound to distrust our theory, nay more—we should cast aside our theory and abandon our doubtful practice. Partisanship in medical theory or practice is a cruel and wicked taskmaster. In the presence of disease and impending death we ought to feel solemnly reminded of the obligations we owe to truth, and the greatest of all obligations, charity toward the opinions of others. Sink or swim, win or lose, God grant that we may enjoy the comfort and consolation of this heavenly grace. So, gentlemen, when I have, in relation to this subject, appeared an enthusiastic supporter or advocate of the anti-phlogistic treatment of inflammation, you must understand me as referring to what I call idiopathic inflammation, and by no means to what I call inflammation from specific causes. The early recognition of inflammation from specific causes, as small pox, measles, erysipelas, and the blood poisoning products of traumatic and idiopathic inflammation, led to what received the name "The Humoral Pathology." That is a branch of our general subject which I will not follow in this

dissertation further than to say that inflammation, from such specific causes, is still essentially inflammation, in all its phenomena and consequences as idiopathic inflammation, but that its proper treatment is as far from it as is the north pole from the south pole. Inflammation is not a disease *per se*; it is a natural process for the repair of injury, for the elimination of specific toxic matter that has reached the blood circulation, or it is the penalty and compensation nature demands for an immediately preceding injury or affront to the nervous system. In a state of health there is an equilibrium or equipoise of all the vital functions. Injury to one disturbs all; is appreciated and resented by all. To acquire, repossess or regain the natural status is alike the business of nature, and the object of the physician. As in law, punishment may appear enormously in disproportion to the offence, so in the inflammatory process, once the fire is kindled, medical art will have performed full duty, if it can moderate and modify the superfluous and excessive natural impulses, preventing undue effusion and its train of disastrous consequences. Among doctors, as well as laymen, the most universally assigned cause for idiopathic inflammation is suddenly changed temperature, general or local, generally also from heat to cold, aggravated by moisture. Waiving the preliminary symptoms of sneezing, increased action of the lachrymal glands, and the stoppage of the secretions, yawning, lassitude and general undefinable discomfort and uneasiness, the first unmistakeable symptom of impending inflammation is the chill or rigor. That is the alarm gun for the coming struggle. The severity and duration of that chill or rigor conveys fair warning of the part the sanguineous system will take in the battle. The rigor or chill denotes the offense to the nervous system; it is the lightning's flash, but the heart and arteries will respond in crashing thunder. The former is the gathering of the waters; the later is the roaring flood.

Any discussion of a microbian cause of idiopathic inflammation is yet premature. What facts may yet be found, or what theory based thereon, I do not know and cannot pretend to forecast. So far as treatment throws any light upon the nature of inflammation it must depend upon the kind of treatment

given. Here, unfortunately, we are by the ears. My argument would be based upon my treatment and your argument upon your treatment. As to the products of unchecked inflammation, and the ultimate consequences of such products, we ought not to disagree, nor in that estimate should we overlook the barricading of the watchful, faithful guardian cells—to protect the system from universal infection and contamination. There is a field in the plan of treatment, yet to be cultivated, relating to the stage of chill or even before chill actually begins. After the chill, we know full well what will come next. But before or during the chill, cannot something be done to appease the nervous system or allay its severity and duration, and if so, might we not reasonably expect a modified or less rampant condition of the sanguineous system? Possibly some anaesthetic, either known or that may be discovered, that administered at that early stage, might so act upon the nervous system as to abort the natural train of symptoms that always follow.

My theory and practice is grounded upon a direct attack upon the sanguinary system. Of course the physician takes each case as he finds it, too often, not until the chill has gone and the heart and arteries are going at high pressure. Even at this stage may not the nervous system be forced to withdraw the vigor of its impelling force to the circulatory system? I well know the importance, advantage and utility of early venesection. The period for its greatest utility is before effusion takes place, just as a pail of water will stop an incipient fire, which neglected for a few moments will defy a torrent of water. Neither phlebotomy or any other medical treatment is of much promise after the stage of thickening of the serum, moco-purulence, ulceration, formation of pus and gangrene.

The disasters wrought by the inflammatory process, as observed during life, and as revealed by post mortem examination, are referable entirely to undue or excessive natural work of the sanguineous system. Whether any course of treatment directed solely to the nervous system in inflammation subsequent to effusion will prevent the morbid changes that must occur from excessive vascular action may well be doubted at

the present stage of medical knowledge. Whatever line of treatment is adopted to prevent dangerous or fatal results from the inflammatory process, should be directed to the prevention of deposit, of whatever abnormal character, by the blood. I often hear you, or some of you, remark, somewhat guardedly, that perhaps in well selected cases phlebotomy may be performed with advantage. Were this the result of practical demonstration it would be much more to the point. This admission, so far as it goes, is consonant with the antiphlogistic theory; but is only grudgingly permissive. Those who would successfully teach, must *direct*, not permit. Once for all, I must beg to suggest that, in this behalf, individual experience alone qualifies to speak with authority. This qualification only will properly fill the expectation of students of medical art.

There are cases enough where we can make the daily visits and wait with patience and hope that something favorable will turn up, but an acute inflammation of a vital organ or part is not that kind of case. Fortunately, simple serous effusion may often become absorbed, taken up and removed by natural processes; *less often*, if it becomes muco-purulent, indurated or pus, and wisely so, for in the latter changed condition, unless the watchful cells shall have erected their barriers to prevent it, absorption develops an infective inflammation many times more dangerous than the original. Whether this last is more properly called hectic fever, or fever from infection, or secondary inflammation, or specific inflammation, matters little so far as a name is concerned. Muco-purulent, or pus quantities, should be visited as soon as detected, *wheresoever located*, by lancet, bistoury, trocar, or needle and pump.

The word *inflammation* from "flamma" is not well chosen to express the cause, nature or initial factor in that process. It subdates the beginning of the disturbance and directs our attention to a single symptom of the secondary or consequential stage of the abnormal process, to wit: A sense of increased heat—largely a false impression, for the real increase of heat makes but feeble impression upon the thermometric scale. The term inflammation, however, has been so long and universally in use that it would be difficult to provide a new

word to take its place. Perhaps this is a proper place to allude to another closely allied condition universally designated *fever*. The prominent pathognomonic symptoms of these two abnormal conditions have such a resemblance and are often so difficult to differentiate, that an idea of a common or similar origin is forcibly suggested, notwithstanding a thousand authors and teachers have given us to understand otherwise. The word *fever*, from fire, as well as *flamma*, designates and represents in either case the sense or feeling of increased heat, whether real or only apparently or seemingly so. Neither of the terms relate to the primary origin of the symptoms, or give any idea as to the initial or starting point of the *flamma* or the fever. Even such terms, however, are not destitute of ability to constantly impress our *attention and curative efforts* in possibly a wrong direction. I earnestly ask you gentlemen to carefully and thoughtfully interrogate yourselves as well as medical writers as to this. Other words coined or selected at this late day I am aware would need the approval or fatherhood of a demigod. The word hazel, without the prefixed witch, is merely an indifferent bush, but witchhazel is magical forever. Stand by the dicta of the fathers, though the heavens fall. That is just as appropriate, and just as inappropriate, in medical art as in law, philosophy or theology. Perfection in these branches of human knowledge seems apparently as far distant now as in the long ago. Our experience and observation teaches us, if it teaches us anything, that in all these matters there is a possibility that there may be a re-statement of general principles along these lines. It were idle to deny that there has been improvement, but the final, the ultimate, has yet to be said and written. In the main, men are born and die the same as of yore. Those who do not die, we claim to have saved by our art, but first or last all die just as from the beginning. *Vis medicatrix naturæ*, we may personify as of comely countenance, of gentle mien, most welcome and unseen visitor, whether men wake or sleep, still going about doing good, without heralds, unushered, unknown, unknowable, true inspirer of hope, of courage, of faith. Only another feature of the unknown quantity.

The nature of inflammation, like the nature of fever, we shall solve, if ever, at one and the same time. There is something prior to the *flamma*, something that antedates the *fever*. Both conditions begin with a sense of cold, or chill; both are followed by the sense of increased heat. This, if far enough to trace the symptoms to show us that neither *flamma* nor fever indicate anything as to the nature or cause of the symptoms observed or experienced, we must admit that the secondary factors, in either case, are disturbances of both the nervous and sanguineous systems, and in the nature of cause and effect. That the train of symptoms originates in either case in some offense to the nervous system, I think it palpably manifest. Of course the nervous system depends upon a constant supply of healthy blood, and the heart and arteries depend also upon constant nervous supply of energy. These functions are mutually dependent, one upon the other, and each sympathizes with the other. In inanimate nature we are not ignorant of the violent disturbance that occurs to molecular attraction by sudden change of temperature from heat to cold, as instanced in the congealing of water, the fracture of glass and metals, the tempering of steel and iron. In both *flamma* and fever, the treatment relates almost entirely to the prevention or controlling of the effects likely to be produced by an excessive action of the sanguineous system. The fatal results, in either case, are of the same nature and character. The primary symptoms and causes are of nearly allied character. Though we do not speak of specific causes for the term idiopathic inflammation, or of many fevers, yet, why not? Have we not seen cases enough of inflammation from a heated condition to cold, to make it quite certain that such sudden change is as certain to produce febrile or inflammatory action as is hot water or hot iron, or as contact with smallpox, measles, scabies or scarletina, is to produce those disorders. Why then is cold air not specific in its action? The shock to the nervous system produced by fright, though only temporary, is responded to on the instant by the heart's increased action. Though this quickly subsides, the damage to the nervous system may prove lasting. What we *do not observe* in the frog, dog and rabbit, as the emotions in man of

love, anger, fear, hatred, jealousy, mere shadows of reality, mere conjurings of the mind, as unreal as dreams, yet, unsubjected to sober reason, and the commonest common sense, may lay the foundation for many a lingering fever, many a desperate inflammation. Whether the poor bull-frog catches cold by getting his feet wet, or is exasperated by emotions as are men, I do not know. Are the effects of these inward disturbances the promptors to the final and fatal changes found upon post mortem examinations? I think so. Like the beginning of inflammation from traumatic and other recognized causes first manifest by the exciting effects upon the nervous system and depressing effects upon the sanguineous system culminating in chill or rigor. I would gladly sum up my conclusions by a theory upon which I think treatment should be based, and it would not be on the lines that you or I have been instructed, but that is not my undertaking in this brief paper. That would not be an answer to the problem you have given me. I have had, in mind, simply to trace the phenomena of inflammation as herein limited, to its origin. The light of my compass points to the nervous system, and if I have the bearings, it still leaves the how and the why unexplained. The secret mystery of the nervous system I cannot fathom, possibly you can. How it receives or imbibes its displeasure is a mystery. How it manifests its resentment we may discover in making our autopsies.

Mr. President and Gentlemen: I present you this brief paper on a great and important subject. That it is a perfect statement of the nature of inflammation I dare not affirm. As to the criticisms you may bestow upon it, neither myself or you are competent to decide as to their justness, fallibility or infallibility. The apparent and real truth is, that even at this late day, the theories and the practice for the alleviation or cure of this particular class of disordered actions, is in a decidedly chaotic condition. A hundred theories have been advocated and entertained, and at last cast aside as worthless. As to treatment, one extravagance has followed another; some cases have recovered, and the others have died. Every one thinks

he has cured some; none will admit that they have damaged some and killed others. I admit that I once had much firmer convictions as to a theory and also as to treatment than I have now. However, I am still unsatisfied and unconvinced that the most modern treatment is productive of better or equally salutary results as under a rule of practice which I followed with all its imperfections. You gentlemen are now in the race, and must run the gauntlet, taking the assaults from right and left, from front and rear, and I can only hope that, as you emerge from the ordeal, you may be awarded a crown of everlasting victory.



